Chapter 6
Analysis of Variance

In the usual linear models for experimental designs the cell means are decomposed into an overall mean, main effects and interactions. In general, such models are called analysis of variance (ANOVA) models, and statistical problems involving such models are called ANOVA problems. The term 'ANOVA' was introduced by Fisher (1925) to designate a statistical technique for analyzing a structure of cell means by obtaining estimators of the variance under various hypotheses. It is known that in most cases, test statistics for ANOVA hypotheses can be derived by decomposing the total sum of squares. For the case of balanced data, there is a general consensus on the definition of main effects and interactions, the meaning of ANOVA hypotheses, the calculation of sums of squares of tests of ANOVA hypotheses, etc. However, there is some confusion as to for the case of unbalanced data. The present chapter consists of two papers. The first paper is mainly expository and concerns ANOVA models and problems of two-way classification design with fixed effects and unbalanced data. The second paper discusses ANOVA problems of some balanced fractional factorial (BFF) designs, based on an algebraic structure.